Greenbelt Astronomy Club

METEOR

THE NEWSLETTER OF THE GREENBELT ASTRONOMY CLUB, INC.

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The Geminid Edition

Mythology of the Winter Constellations

Topic of December Speaker

On Thursday December 20th James Link will relate tales of passion, lust, violence, hubris, and damsels in distress and heroes to the rescue in a presentation on the mythology of the winter constellations. Mr. Link is an Assistant Professor of Developmental English at Prince George's Community College and spends much of his time relating to school children, teachers and community groups how different cultures have immortalized their beliefs by making them constellations of the night sky. Mr. Link will not only review the Greco/Roman myths but will also discuss how different cultures have used the very same stars to form different constellations immortalizing different beliefs. Throughout human history, every culture that could see the night sky has used the night sky as a graphic representation of their values and beliefs. A special link exists between the topics of mythology and astronomy, especially so for star gazers. Mr. Link will help us understand how our ancestors and the ancestors of other cultures organized the night sky in ways that have become the foundations of the science of astronomy we practice today.

News Flash - Donations Received

It has just been reported that donations for the Greenbelt City Observatory project totaling over $1,500 have been received since the November 30th meeting from club members. This amount is in addition to the $8,369.32 reported in the Capital account by the Treasurer at the Nov. 30th meeting. Thank you members and keep up the good work.

Leonid 2001 Report from Screech Owl Hill Observatory

Reporting From Mountain Meadows, West Virginia - G.W. Gliba

We had a good view of the Leonids from Mathias, West Virginia near Lost River State Park. Club members Matt Elliott and Valerie O'Brien, joined Lynne, myself, and Forrest Hamilton and his family at our cabin for the peak night of the highly anticipated Leonid Meteor Storm. Luckily, it was clear the whole night.

There was a slow rise in the rates rather than a sharp peak, and there were many meteors observed. Even with strong twilight, I saw 750 Leonids (LM=5.8) from 10 to 11 UT; so the ZHR was probably over 1400! There were times when a Leonid a second was seen. One time had five Leonids in two seconds that were distributed all around the radiant, like spokes on a wheel. A few times there were simultaneous Leonids diametrically opposed.

Several times Lynne and I would look over at one part of the sky to follow a meteor, and look back to see the train of a Leonid that we missed! The average Leonid was 1st or 2nd magnitude, and left a train. From 7-11 UT I saw over 1600 Leonids. Some nice bolides were also seen. Lynne saw several in the western sky where few people were looking.

Personally, the meteor rates seen for this Leonid storm made it by far the best meteor shower, in terms of the number of meteors seen, I have seen in my 40 years of meteor observing (I missed the 1966 storm).

Meteor

Some Leonid 2001 Reflections - by G.W. Gliba

I thought it may be of interest to give some of my thoughts & experiences about the Leonids Meteor Storm 2001 from Mathias, West Virginia. First, is ZHR. What is considered a reasonable time sample for a ZHR? If it is 15 minutes, then I would say the ZHR was about 1200 near 11 UT, but if only a few minutes can be used, then the ZHR was probably twice as high for a few minutes, during several periods from 10:15 to 11:00, and three or four times as high if a minute or fraction of a minute can be used for a ZHR.

There were flurries of several seen within a second, and one a second for a few seconds, indicating a ZHR of 3600 or higher over a period of less than a minute. Anyway, if a "true" ZHR of 1000 (actual meteors seen in actual time) or more is by definition a storm, then we saw a true storm between 10:00 and 11:00 UT in the eastern USA, when making the standard corrections for zenith distance and limiting magnitude. I observed 784 actual Leonids (with LM=5.8) in that "real" time period. As for multiple peaks, there were probably several sub-peaks from filaments from the 1767 trailet, with high short period ZHRs well above 1200.

Personally, the meteor rates seen for this Leonid storm made it by far the best meteor shower, in terms of the number of meteors seen, I have seen in my 40 years of meteor observing (I missed the 1966 storm). However, the 1998 Leonid Bolide Shower was still the best for the number of Leonid Fireballs seen (23 fireballs in 3.25 hrs). Both were wonderful things to experience.

Leonids to the Minute During Nov. 17/18, 2001 Peak
Screech Owl Hill Observatory
Mountain Meadows, Mathias, West Virginia
Lat. 385710N Long. 0785544W - G.W. Gliba

Time (UT)	LM	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	LEO Total	(others) SPO
10:00-10:01	6.4	0	0	0	0	2	3	7	4	1	0	0	17	0
10:01-10:02	6.2	0	1	0	2	0	2	2	1	0	1	0	9	1
10:02-10:03	6.1	0	0	1	0	0	2	2	1	0	0	0	6	0
10:03-10:04	6.1	0	0	0	0	1	2	10	2	1	1	0	17	0
10:04-10:05	6.1	0	0	0	0	0	2	3	1	0	0	0	6	1
10:05-10:06	6.1	0	0	0	0	1	1	2	2	2	1	0	9	1
10:06-10:07	6.0	0	0	0	0	1	1	5	3	0	1	0	11	0
10:07-10:08	6.0	0	0	0	0	0	2	5	2	0	0	0	9	0
10:08-10:09	6.0	0	0	0	2	2	0	4	2	0	0	0	10	1
10:09-10:10	6.0	0	0	0	0	0	0	5	3	0	0	0	8	0
10:10-10:11	6.0	0	0	0	0	0	0	2	3	0	1	1	7	0
10:11-10:12	6.1	0	0	0	0	0	1	2	3	2	0	0	8	0
10:12-10:13	6.0	0	0	1	0	1	2	5	2	2	3	0	16	0
10:13-10:14	6.0	0	0	0	0	1	2	2	1	0	0	0	6	0
10:14-10:15	6.0	0	0	0	0	0	2	4	0	3	2	0	11	0
10:15-10:16	6.0	0	0	0	0	1	1	6	6	1	0	0	15	0
10:16-10:17	6.0	0	0	0	0	0	3	4	2	0	0	0	9	0
10:17-10:18	6.0	0	0	0	0	0	3	11	2	3	0	0	19	0
10:18-10:19	6.0	0	0	0	0	1	2	4	1	0	0	0	8	1
10:19-10:20	6.0	0	0	0	0	0	3	7	1	0	0	0	11	0
10:20-10:21	6.0	0	0	0	0	0	2	5	3	0	0	0	10	0
10:21-10:22	6.0	0	0	0	0	1	0	3	4	0	0	1	9	0
10:22-10:23	6.0	0	0	0	0	0	6	15	10	0	0	0	31*	0
10:23-10:24	6.0	0	0	0	0	0	1	4	7	1	2	0	15	0
10:24-10:25	5.8	0	0	0	0	0	1	3	4	0	0	0	8	0
10:25-10:26	5.8	0	0	0	0	2	3	3	4	2	0	0	14	0
10:26-10:27	5.8	0	0	1	0	1	0	8	5	4	0	0	19	0
10:27-10:28	5.8	0	1	0	0	1	1	7	6	1	0	0	17	0
10:28-10:29	5.8	0	0	0	0	1	2	4	3	1	1	0	12	0
10:29-10:30	5.8	0	0	0	1	1	2	6	6	0	0	0	16	0
10:30-10:31	5.8	0	0	0	0	1	5	6	8	1	1	0	22	0

													Meteor	
10:31-10:32	5.8	0	0	0	0	0	5	9	6	1	1	0	22	0
10:32-10:33	5.8	0	0	0	0	0	1	5	4	0	0	0	10	0
Time (UT)	LM	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	LEO Total	SPO
10:33-10:34	5.8	0	0	0	0	0	1	3	1	0	0	0	5	1
10:34-10:35	5.8	1	0	0	0	1	2	6	5	2	0	0	17	0
10:35-10:36	5.8	0	0	0	0	0	3	7	3	2	0	0	15	0
10:36-10:37	5.8	0	0	0	0	0	3	9	4	2	0	0	18	0
10:37-10:38	5.8	0	0	0	0	0	2	9	3	2	0	0	16	0
10:38-10:39	5.8	0	0	0	1	0	2	13	9	3	1	0	29*	0
10:39-10:40	5.8	0	0	0	0	1	1	3	1	1	0	0	7	0
10:40-10:41	5.6	0	0	0	0	1	2	4	3	1	0	0	11	0
10:41-10:42	5.6	0	0	0	0	2	0	5	3	1	0	0	11	0
10:42-10:43	5.6	0	0	0	0	1	2	6	6	0	0	0	15	0
10:43-10:44	5.5	0	0	0	0	0	1	7	8	4	0	0	20	0
10:44-10:45	5.5	0	1	0	0	0	0	8	8	2	0	0	19	0
10:45-10:46	5.5	0	0	0	0	2	0	4	9	1	0	0	16	0
10:46-10:47	5.5	0	0	0	0	1	0	6	5	1	1	0	14	0
10:47-10:48	5.5	0	0	0	0	1	1	6	6	1	0	0	15	0
10:48-10:49	5.5	0	0	0	0	1	1	8	3	0	1	0	14	0
10:49-10:50	5.5	0	0	0	0	2	1	3	1	0	0	0	7	0
10:50-10:51	5.5	0	0	0	0	0	1	3	4	1	0	0	9	0
10:51-10:52	5.3	0	0	0	0	0	1	1	2	1	0	0	5	0
10:52-10:53	5.3	0	0	0	0	1	0	4	7	2	0	0	14	0
10:53-10:54	5.3	0	0	0	0	0	0	8	2	0	0	0	10	0
10:54-10:55	5.3	0	0	0	0	0	0	4	2	0	0	0	6	0
10:55-10:56	5.0	0	0	0	0	0	1	1	2	1	0	0	5	0
10:56-10:57	5.0	0	0	0	0	0	1	2	3	0	0	0	6	0
10:57-10:58	5.0	0	0	0	0	0	1	8	2	0	0	0	11	0
10:58-10:59	5.0	0	0	0	0	0	0	5	5	1	0	0	11	0
10:59-11:00	4.5	0	0	0	0	0	0	5	2	0	0	0	7	0
* Denotes Peaks													772	

Rantings of an Amateur Meteor Observer

By Albert Sheldon Ph.D.

Wow!!!! I can honestly say that this was my first meteor shower where I viewed hundreds of meteors descending from the sky in a very short period of time and it was a wonderful experience. I feel that my entire experience of viewing the haphazard meteor by chance was summed up 100-fold in two hours of viewing the Leonid shower this weekend. I got dizzy turning my head trying to catch every meteor that came within peripheral vision.

My first objective was to prepare for the session so I logged onto the SKY and Telescope web page and downloaded information on "How to Observe Meteors". Then I set of to The Woods in West Virginia to spend time at my cabin and prepared to do some viewing. The night before, I went out with my 10x50 binoculars to reacquaint my self with the night sky. The next day, I got up at 9:00 UT and headed to the pool area to view the shower (No pun intended). When I arrived, two other cars were already there and by the time morning broke, approximately 15 carloads of couples, parents, and children came through. A friend at another site at the Woods told me that they had 10-15 cars also so the event was well attended at the resort.

The morning of observation was magnificent since the stars in constellations were clearly easy to see as the night before. I estimated the seeing to be 8 to 9 and the transparency (limiting magnitude?) to be -5.6 by examination of stars in the constellation Ursa Minor. I had more than 120 degrees of open sky in all directions.

The evening began slowly with the occasional meteor but the shower was just beginning. Within an hours time, meteors were lighting up the sky. I tried to observe several regions of the sky for my own gratification. Looking directly at "the sickle" of Leo was very pleasing as I saw the meteors emanating from the radian, especially when they proceeded each

other in quick succession. I think the most beautiful views were about 40 degrees from the radian where long streaks of the meteors could be seen. I was able to ascertain several types of meteors during my viewing and some of different colors. I was most impressed by what I would describe as a fireball. The meteor streaked across the sky but the tail of the meteor and the head were clearly separated by a dark area. I also missed a meteor that actually seemed to light up the book I was trying to write into but did manage to see the location of the bright object because it left a visible plum of material that seemed to glow in the sky like a folding ribbon.
I
observed it for about 10 seconds with my binoculars. My intent was to count meteors as suggested by the S&T article but I found that I was doing less viewing and more writing. I decided that the visual experience would serve me better this time and I just sat back and watched the fireworks.

My thanks to those members that provided a scientific presentation of the observations they made since it helped me answer questions that remained in my mind. Also, the information provided an example on how data should be collected and presented. Impressive George. Do you use a recorder?

Albert T. Sheldon Jr. Ph.D.
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Astronomical Data for Club December Observing Dates

The following information is provided for Greenbelt, Prince George's County, Maryland (longitude W76.9, latitude N39.0):

December 8th 2001: Sunset 4:45 PM EST / End Civil Twilight 5:15 PM / Moon Set 1:18 PM / Moon Rise 1:19 AM the following day. Moon phase is Waning Crescent with 40% of the moon's visible disk illuminated.

December 15th 2001: Sunset 4:47 PM EST / End Civil Twilight 5:17 PM / Moon Set 5:33 PM / Moon Rise 8:59 PM on the following day. Moon phase is Waxing Crescent with 1% of the moon's visible disk illuminated. Would make an impressive sight in the civil twilight, but expect it to be challenging to find.

New Faces Sought for Club Officer Positions

After many productive years as officers and having reached the end of the term limits, the current President, John Settle and current Secretary, Bill McHale will not be available for officer positions in 2002/2003. Bill is eager to continue as head of the telescope committee and to take up the position of ALCor. The club will be holding elections for new officers in February of 2002. Members interested in serving are encouraged to contact the Board at any club function. The four elected officer positions are President, Vice President, Secretary and Treasurer. Executive officers also serve as the Board of Directors. State law requires a minimum of three persons on the board. Many long time goals will be coming to fruition in 2002 and it is hoped that members will "step up to the plate" and assure an orderly transition and continuity to the club's operations.

Digital vs Optical Zoom in Astro-Photography

By Ron Lee

The CCD schema and digital vs. optical zoom, in particular, seems to have injected a lot of mystery into digital photography for a lot of people. The confusion is unfortunate because knowing how the CCD and digital zooming works can make a great deal of difference in how one approaches making an exposure and the quality of the pictures produced. As I understand it, the system works like this:

The CCD array, whether in an expensive Santa Barbara astronomical device or a point and shoot digital camera, consists of a rectangular array (parallel rows) of closely spaced and very tiny (micron sized) light sensors. The number of sensors in a row and the number of rows is what is meant by a "pixel" specification such as "1040x720" (i.e., 1040 rows of sensors with 720 sensors in each row). Each of these sensors can be thought of as an independent bucket that fills up with electrons when photons hit it --- the more photons that hit one of these buckets, the more electrons it will contain.The flat sensor array is positioned in the focal plane of the camera/telescope (i.e., the plane where the physical lens or telescope optics produces an image). Of course, the image produced by any lens system is nothing more than a variation in light intensity (number of photons) distributed over the plane of focus of the lens. If we put a CCD array in this plane, each individual sensor becomes a monitor of the light intensity at that point in the image.

Meteor

To take a picture, we start with the shutter closed (no light falling on the sensor array). When we press the button to take a picture, the sensor buckets usually contain left-over or junk electrons, and the first thing the camera does before opening the shutter is to empty all the buckets. This is responsible for the characteristic (and sometimes maddening) delay between pushing the button and the shutter clicking on a digital camera. When the shutter does finally open, the sensor array is illuminated and each of the sensor buckets starts filling up with electrons at a rate determined by the intensity of light at its particular location in the image. At the end of the exposure time, the shutter closes, light stops hitting the sensors and the buckets stop filling up with electrons. The exposure is completed by "clocking out" the contents of the buckets. That is, the camera circuitry detects the amount of electronic charge in each of the sensors and assigns a binary number to each sensor location that is proportional to the amount of charge found there. These numbers are stored in a file on the memory card as a numerical array that specifies how "bright" the image is at each of the sensor positions.

Once the sensor array concept is grasped, the difference between optical and digital zooming is easily understood in terms of the fundamental characteristics affecting the quality of the digital image. A principal factor is the physical dimensions of the sensor array. (Try finding this spec in a camera manual.) To see why this is the case, consider two 1000x1000 CCD arrays that are of physically different size. Let's say that one is 1 cm x 1 cm and the other is 2 cm x2 cm. Although they both have one million sensors, they will produce qualitatively different pictures when used with the same camera lens. It is not so much that one is better than the other than that they accomplish different purposes. Let's say we took pictures with the two devices using the same camera lens. The physically larger array would intercept a wider and longer section of the image projected onto the focal plane and (as long as the array isn't larger than the cone of light coming through the lens) would produce a relatively wide-angle picture. The physically smaller array, on the other hand, would intercept only the central part of the image recorded by the larger one. Printed at the same pixels-per-inch, say 4"x4", we would have two pictures of the same size and near-photographic quality, but one (taken with the smaller array) would appear to be a close-up of the central portion of the other image. That is, 75% of the picture taken with the larger array would fall outside the frame of the "close-up" taken with the same lens using the physically smaller array. The flip side comes when we try to use the image file from the larger array to reproduce the framing of the "close-up". In order to do so, we would have to print a 4"x4" picture using only the central 25% of the pixels recorded by the larger array. We can get a "close-up" of this area, but we have to throw away 75% of the recorded information in order to do so. The result is that the larger array only provides 125x125 pixels per inch compared to the 250x250 pixels per inch of the smaller array when we use the same camera lens and print to the same "magnification". Now, 125 pixels per inch is certainly acceptable, but it is of significantly poorer quality than 250 pixels per inch. We will see small, sharp details in the higher quality print that are only blurs or non-existent in the other. Managing this trade-off between magnification (or field of view) and image quality is the crux of the issues of optical and digital zooming.

The trade-off between field-of-view and quality of the printed digital image is determined by the camera lens focal length, number of pixels (i.e., number of sensors in the CCD array) and the physical size of the array. Obviously, once we acquire a particular CCD array, we are stuck with that physical size and sensor density. We can, after a fashion, control the number of sensors in the array, but only by throwing away information recorded by some of the sensors and, in effect, reducing both the number of pixels and the physical size of the active area. However, the preferred control parameter is the focal length of the lens. This does not require throwing away recorded information and thus maximizes the quality of the image. Thus, if we take a picture and the field of view is too narrow to include everything we want in the picture, the only resolution is to go to a shorter focal length camera lens so as to concentrate the image in a smaller area at the focal plane. We cannot get a wider field of view by throwing away pixel data. In the other direction, if we want a higher magnification, using a longer focal length camera lens spreads the image out on the focal plane so that smaller details are recorded by the sensor array at a sufficiently high digital resolution to make them appear sharp or, at least, recognizable. (This is where the number of pixels affects quality. For a given physical array size, a larger number of pixels will resolve smaller details, produce a higher quality print and afford higher enlargements.) The "optical" zoom feature on digital cameras simply varies the focal length of the camera lens using the usual techniques of physical optics. If the digital camera is being used piggy-back for astronomical shots, one can extend the wide-angle range to greater than 180 degrees using fish-eye lenses offered by some digital camera companies. In the case of using the camera on a telescope eyepiece for projection photography , however, a wide-field limit is imposed by the acceptance angle of the telescope.

Consequently, the wide-angle optical zoom range of the digital camera should be used with caution, if at all, in projection photography. Again, increasing the field of view cannot be done digitally. It must be accomplished by changing the optical focal length, insofar as that is practicable.

The issues of digital zooming arise at the high magnification or tele-photo end of the optical zoom range. Occasionally, the magnification limit on the optical zoom lens falls short of that required to frame a small or distant object properly. If one simply shoots and prints, as most point-and-shoot photographers seem to do, the subject of interest appears in the resulting print as a tiny "thing" in an otherwise dull or distracting background. One way of viewing the problem is to think of the sensor array as being too large for the image. As outlined above, a physically smaller array would reduce the field of view and effectively magnify the resulting image when printed to the same size. In principle, there is some smaller array size that would produce an appropriately framed image of the subject. All we have to do is identify the sensors at the center of our large array that occupy the same area as the smaller array we would prefer. If we only record the pixels from these sensors, the resulting file will print with the appropriate field of view and magnification. The situation is exactly as before: We can get a close-up view from the larger array, but only by throwing away a large part of the available information. The penalty is a significant reduction in the number of pixels and, consequently, the resolution and quality of the recorded image. In practice, enough pixels must be retained to produce a useful image. Digital cameras therefore have digital zooming capabilities limited to a few magnifications (e.g., 2x, 4x). The digital zoom penalty rapidly becomes quite severe. At 4x, more than 80% of the information available from the sensor array is thrown away. Accomplished by optical zooming, the same 4x magnification would retain all available information and print at 4x the pixels per inch of the digitally zoomed image (i.e., 250 vs. 62 pixels per inch for a 4"x4" print in our example).

If it were not for on-board processing, digital zooming would not differ in principle from excessive enlargement of a conventional photographic negative. However, most digital cameras offering digital zoom do more than simple enlargement. Although the digitally zoomed image contains only the information from the reduced number of sensors, the digitized data can be used to simulate the output of a denser array. In example, a 199x199 pixel image can be generated from a 100x100 pixel digital image by inferring a probable brightness value at the midpoints between neighboring "real" pixels in each row and column. In general, the brightness value assigned to a simulated pixel site is some sort of average over the brightness of the neighboring "real" pixels. A file produced in this way would consist of a list of pixel values by row and column, with "real" data entries alternating with synthetic data entries. The expanded array of pixel data contains no more real image information than the original zoomed data, but it has the advantage that it prints out at a higher pixel per inch density and gives the illusion of a higher quality image than it actually has. In practice, the mathematical methods used to generate values for the added pixels are much more sophisticated than a simple average and incorporate image enhancement techniques for smoothing "jaggies" and sharpening detail. The bottom line is that casual users can digitally zoom to the limit and print out 4x6 photos that make them happy campers when they paste them in the family album. However, the data manipulation methods used in digital zoom cameras are specifically designed for continuous tone scenes and will tend to produce disastrous results when applied to astronomical photographs. A program that performs admirably on normal scenes might very well interpret dim star image pixels as noise and blacken them, form a feathery blob from a bright star image as it bravely tries to make an extended object of it or muddy the contrast as it tries to bring the background sky up to a standard mid-gray. Moral: Don't, under any circumstances, use digital zooming in astronomical applications. The critical user will use optical zooming only, recording the unmolested data as a TIFF file. (JPEG and other compressed file methods alter the data and will most certainly degrade the image.) That tiny image of Saturn in the middle of the picture is as good as your camera can do and contains exactly the same image data that is used by the digital zoom feature of your camera. Store the original TIFF file as a read-only file and use copies in Photoshop or astronomical image manipulation software to do the cropping, enlarging and image massaging necessary to get a presentable print. You can always make another copy of the original data if you do a really bad thing. In the end, in order to get a result that is truly representative of the quality of your efforts, you have to wrest control of the image data manipulation away from the camera and do it yourself properly.

Finally, the relationship between "binning" and digital zooming deserves some comment. In short, there is no relationship. Binning is basically a technique for enhancing the sensitivity of a sensor array. Sensitivity is usually defined in terms of the smallest signal that can be differentiated from noise. IF a CCD array is cooled to the point that thermal noise is no longer a factor, then the largest source of noise is the "white" noise in the signal and it has a magnitude that is approximately equal to the square root of the signal measured. If we are looking at a very faint nebula, for example, the signals due to light striking the nebula image areas of the sensor array may be "buried in the noise" even after a reasonably long exposure. Because of the square root dependence of noise, we would have to measure for four times as long to improve the signal to noise ratio by only a factor of two and for sixteen times as long for a factor of four improvement. Twice as long an exposure does not get one nearly twice as good data quality. Even with a big light bucket, there are a lot of dim deep sky objects out there for which the night isn't long enough to get adequate signal to noise from a CCD. Binning is a technique for effectively increasing the signal and reducing the time necessary to achieve adequate signal to noise. In effect, one divides the sensor array into groups of, for example, four sensors each and treats these "bins" as individual pixels. That is, the signals from the four individual sensors are effectively dumped into a single bucket or "bin" and that bin is treated as a unit signal source. "Binning" the four sensors produces a signal that is four times the average single sensor signal and improves the signal to noise by a factor of two. The exposure time would have to be increased by a factor of four to achieve the same result. The penalty for binning a conventional CCD is a substantial reduction in number of pixels. For example, binning an SBIG ST5-C in groups of four would reduce the pixel array from 320x240 to 80x60 --- barely enough to produce a marginally acceptable 2"x1.5" print. This has turned out to be much longer than I had intended. I hope it has been more helpful than boring.

Ron Lee

Greenbelt Astronomy Club Board of Directors Meeting of November 26th, 2001

By Valerie O'Brien, Secretary

The members of the Greenbelt Astronomy Club met at 7:30pm on Thursday, November 26, 2001. The meeting was held in the Greenbelt Community Center. There were 4 board members were the attendees.

The meeting was called to order by Club President John Settle who requested that Valerie O'Brien read the minutes to the October 25 Meeting. The minutes having been read, the floor was open for new business.

- Treasurer's Report: Bill McHale stated that the club had $768.52 in the operations account and $8373.32 in the capital account.

- Business Item : Club Inventory List – Doug Love
  - There is a list of the equipment, books, videos, etc. that belongs to the Greenbelt Astronomy Club. The list is present at the following website : polaris.umuc.edu/~dlove/inventory.xls

- Business Item : The Observatory Project Update
  - The club is planning to transfer the title of ownership of the observatory dome to the City of Greenbelt. Doug Love is contracting a lawyer through Adventist Risk Management, Inc. to draw up the appropriate documents for this transfer. . The GAC will own the telescope and equipment and will be the operators and managers of the observatory.
  - An estimate from Greenman-Pederson, Inc. has been given to the club for the observatory site plan. The total fees are estimated to be $6679.00
  - The fee for the soil analysis was $1761.00
  - It is still to be decided whether to go with a concrete or wood platform next to the observatory. The mechanical strength of the soil is low, so it would be best to spread out the weight over a large surface area. Concrete would be a good option to spread out the weight, but it also absorbs heat from the sun. Wood absorbs less heat but is built on piers that concentrate the weight of the platform.

- Business Item : Telescope Committee Report – Bill McHale
  - The work is finished on the 17.5" mirror for the club's Dobsonian telescope.
  - Work has begun on a 13.1" mirror for the observatory. An anonymous donation was made by a club member to purchase the spider and mirror for this new telescope.
  - Work on an ultra-light Dobsonian telescope is underway.

- Announcements :
    - Please submit your contributions for the Observatory Project now. We plan to collect the matching funds from the Mead's soon.
    - We need members to serve on the board for next year. The elections will be in February 2002. Please contact a board member for details if you are interested in running for Secretary, Treasurer, Vice-President or President.

The meeting was adjourned at 9:35 PM.

Greenbelt Astronomy Club Regular Meeting of November 29, 2001

By Valerie O'Brien, Secretary

The members of the Greenbelt Astronomy Club met at 7:30pm on Thursday, November 29, 2001. The meeting was held in the Planetarium of the Owens Science Center. There were 27 attendees and 19 of these were club members, so a quorum was present.

The meeting was called to order by Club President John Settle who dispensed with the reading of the November 26 meeting minutes.

- Announcements :
    - Please submit your contributions for the Observatory Project now. We plan to collect the matching funds from the Mead's soon.
    - We need members to serve on the board for next year. The elections will be in February 2002. Please contact a board member for details if you are interested in running for Secretary, Treasurer, Vice-President or President.
    - The upcoming observing dates for December are the 8th and 15th.
    - The Goddard trips to Caroline Furnace are scheduled for the weekends of April 12 – 14 and October 4 – 6, 2002. Contact Keith Evans with the Goddard Club at evans@umbc.edu for details.

- Business Item : Membership Dues
    - Club members voted "Yes" to have one flat fee for membership and dues, whether individual or family. It is be $15.00.

- Business Item : Telescope Committee Report – Bill McHale
    - The work is finished on the 17.5" mirror for the club's Dobsonian telescope.
    - Work has begun on a 13.1" mirror for the observatory. An anonymous donation was made by a club member to purchase the secondary and primary mirror for this new telescope.
    - Work on an ultra-light Dobsonian telescope is underway.

- Treasurer's Report: Bill McHale stated that the club had $773.12 in the operations account and $8369.32 in the capital account.

- Business Item : The Observatory Project Update
    - The club is planning to transfer the title of ownership of the observatory dome to the City of Greenbelt. Doug Love is contracting a lawyer through Adventist Risk Management, Inc. to draw up the appropriate documents for this transfer. The GAC will own the telescope and equipment and will be the operators and managers of the observatory.
    - An estimate from Greenman-Pederson, Inc. was given to the club for the observatory site plan. The total fees are estimated to be $6679.00
    - The fee for the soil analysis was $1761.00
    - It is still to be decided whether to go with a concrete or wood platform next to the observatory. The mechanical strength of the soil is low, so it would be best to spread out the weight over a large surface area. Concrete would be a good option to spread out the weight, but it also absorbs heat from the sun. Wood absorbs less heat but is built on piers that concentrate the weight of the platform.

- Main Presentation : Titan – Our Second Sister Planet – Presenter : Lou Mayo (Raytheon/NASA/GSFC)
    - The speaker was not present.

The meeting was adjourned at 8:30 PM.

- ***Meteor*** is the official publication of the Greenbelt Astronomy Club, Greenbelt, Md. and is distributed as a privilege of membership. Articles and other contributions are welcome. Membership in the Greenbelt Astronomy Club is open to anyone interested in astronomy. The club meets on the last non holiday Thursday of each month at 7:30 p.m. at the H. B. Owens Science Center.
- The Greenbelt Astronomy Club is a non profit community based organization with the goal of encouraging public interest in science; astronomy in particular.
- More detailed information on our club activities and organization can be found at our web site. The Editor of this newsletter can be contacted at: greenbeltastroclub@yahoo.com
- The Clubs location on the world wide web is: http://lheawww.gsfc.nasa.gov/docs/outreach/gac/GAC.html

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Next Greenbelt Astronomy Club Star Party and Meeting

Open observing sessions are scheduled for Saturdays, December 8th and 15th at James N. Wolfe Ball fields, Northway in Greenbelt. A map is available on the club web site. Hopelessly overcast skies will cause this event to be canceled. You are invited to attend and bring a friend with cookies. Since star parties are dedicated to observing the night sky, they will only be held if the sky is clear enough to permit observing. Star parties will not be held if skies are overcast or mostly cloudy. Observing begins at dusk.

The next regularly scheduled meeting of the Greenbelt Astronomy Club will be Thursday, December 20th at 7:30 PM at the H. B. Owens Science Center on Greenbelt Rd. in Lanham, Md. Topic: Mythology of the Winter Constellations Presenter: Mr. James Link of Prince George's Community College.

All events and meetings are open to anyone with an interest in astronomy and cookies.

The Greenbelt Astronomy Club
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Greenbelt, Md. 20768
Information Line: (301) 277-4041

That's All for Now, Folks!!

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